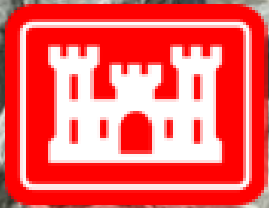


Engineering with Nature: Breakwaters for the creation of Submerged Aquatic Vegetation (SAV) habitat



Evamaria W. Koch,
Nicole Barth, Dale M. Booth, Cindy
Palinkas and Deborah Shafer

Horn Point Laboratory
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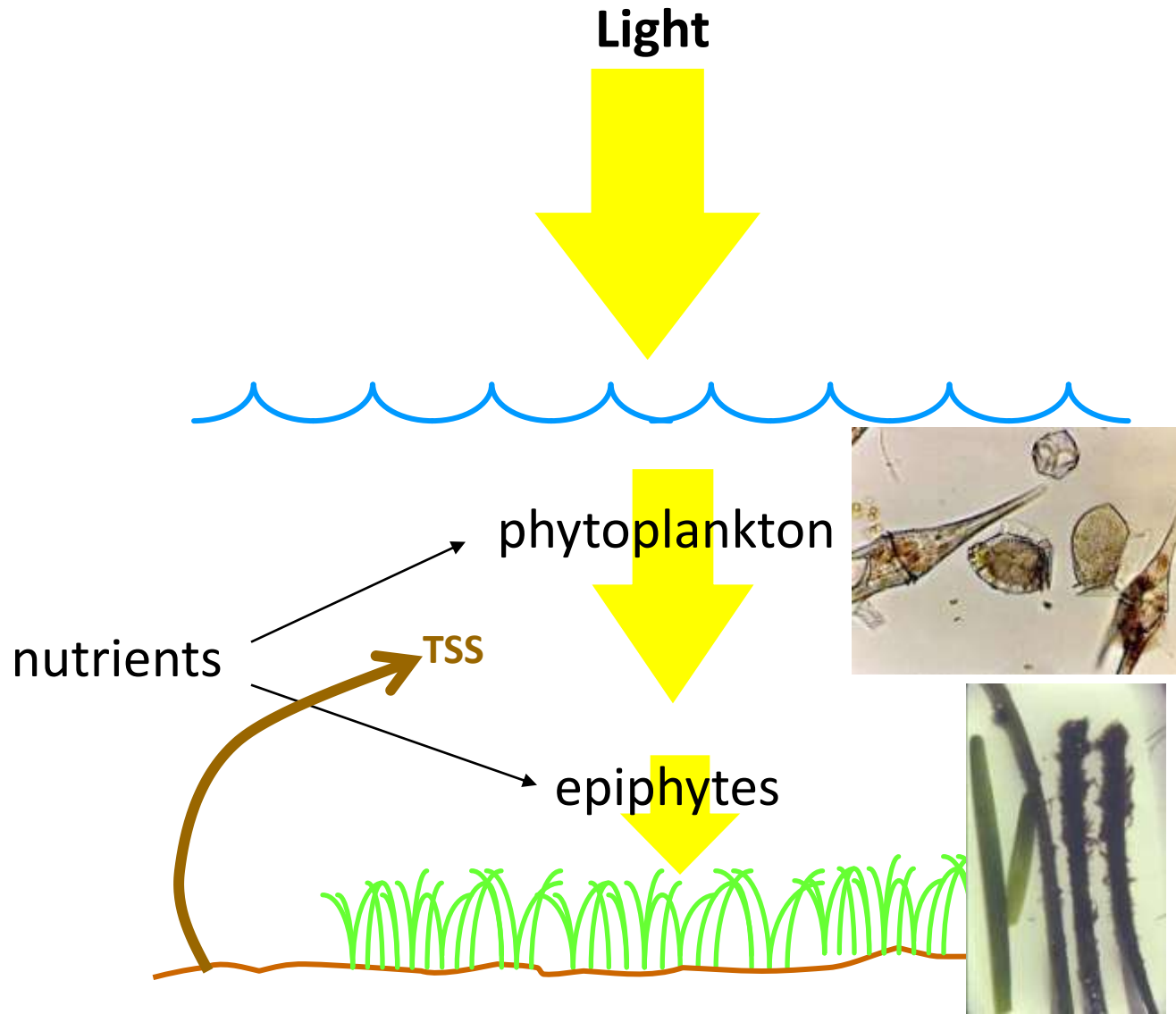


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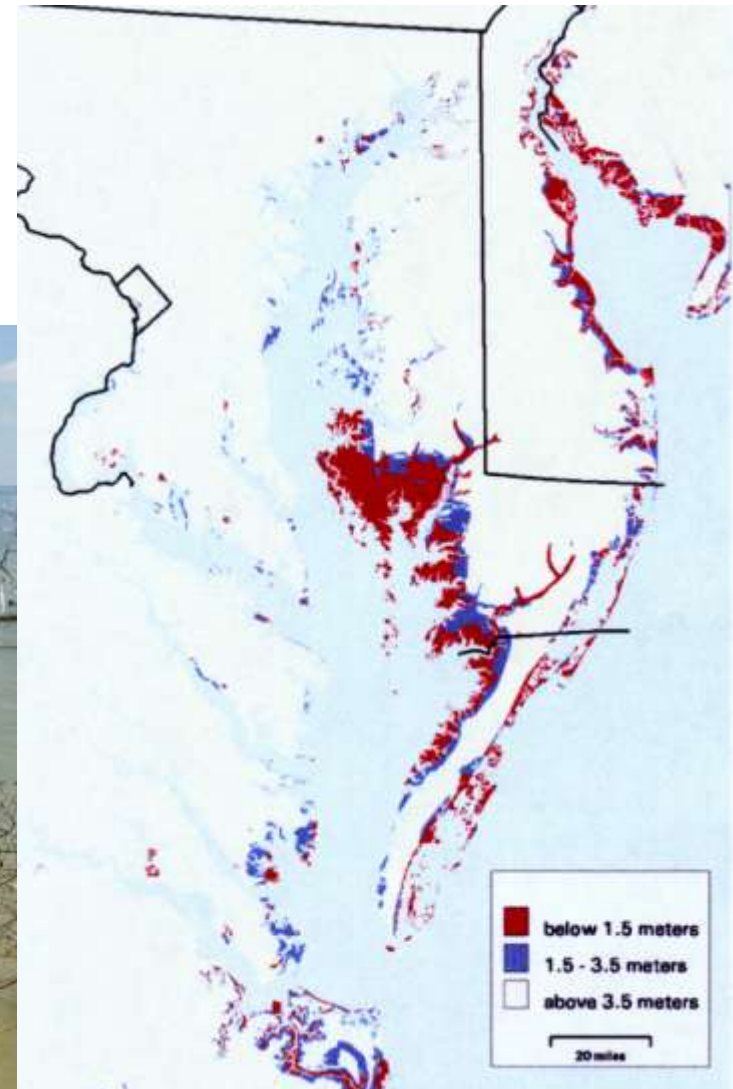
SAV - flowering, rooted aquatic (submersed) plants
One of the most important coastal habitats.

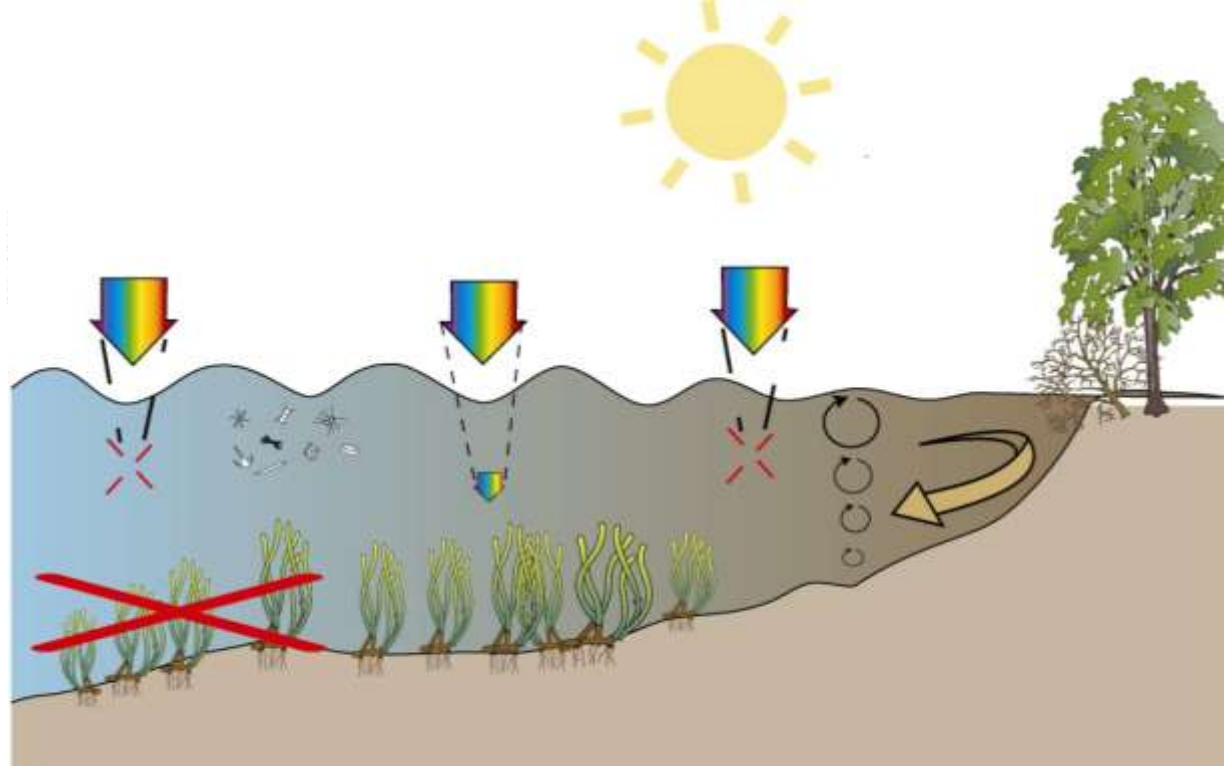
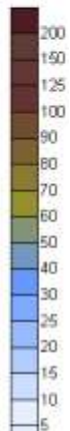
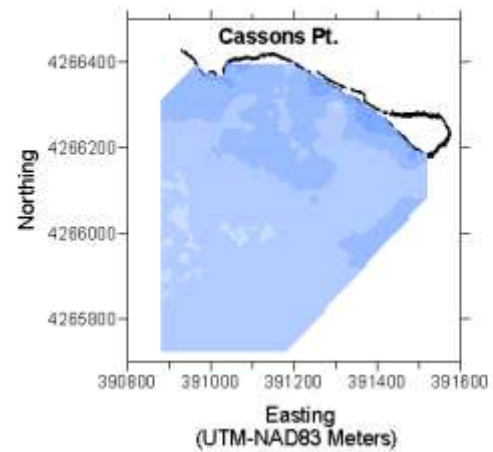


SAV have been disappearing at an alarming rate.
Causes: eutrophication = lack of light.

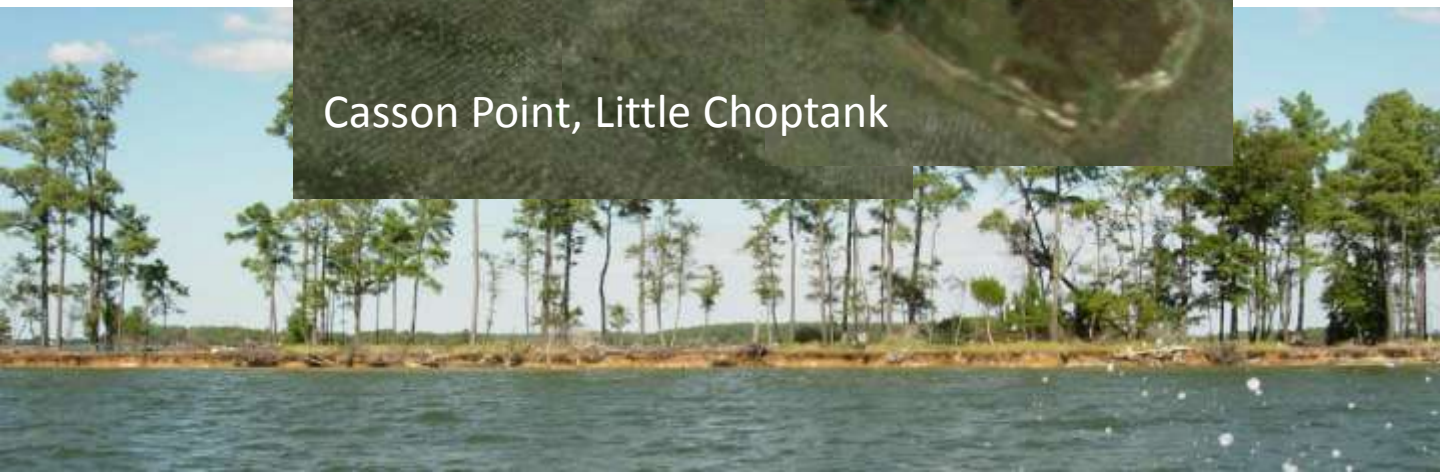


Another cause of water turbidity: shoreline erosion





Casson Point, Little Choptank



But not all sediments are equal. Sediment type
being eroded matters!

Erosion of mud leads to higher turbidity - bad for SAV.

Erosion of sand - to a certain extent, good for SAV

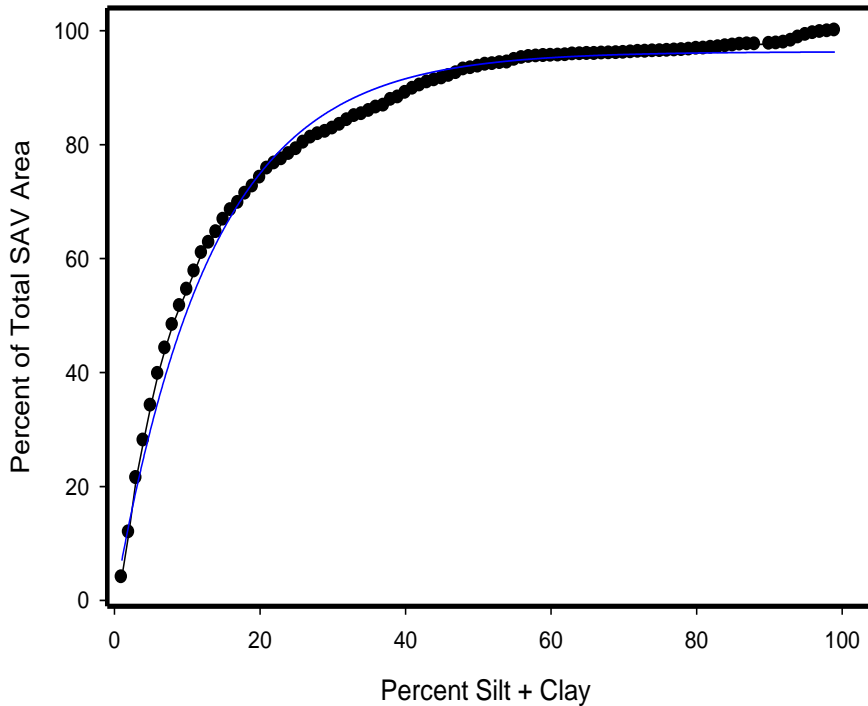
Mason Neck State Park, Potomac River



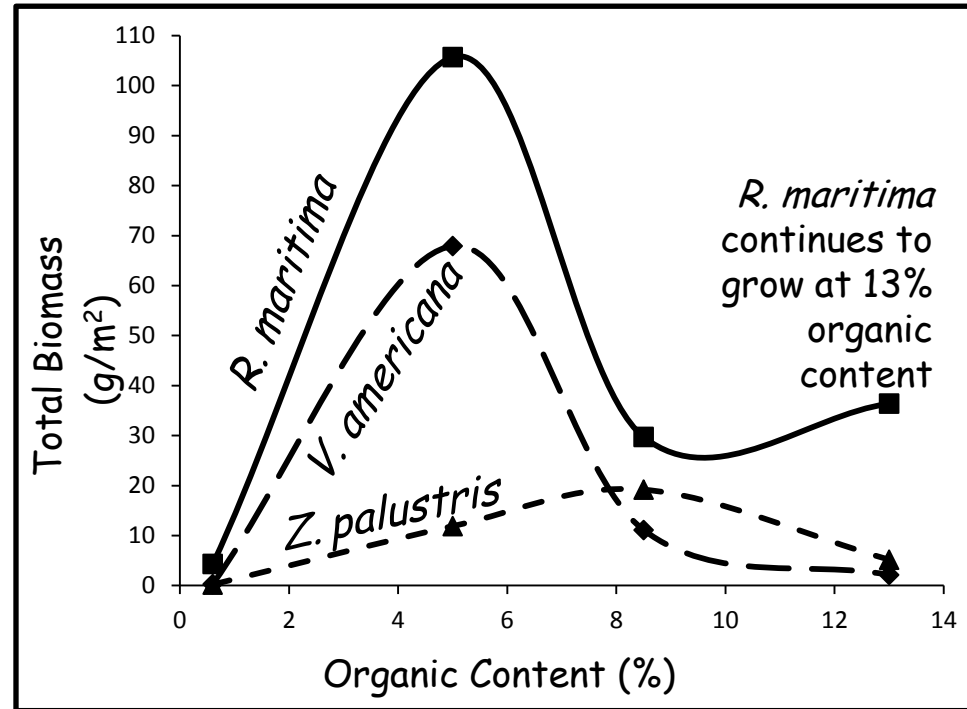
Cook's Point, Choptank River



SAV need > 65% sand, < 5% organic matter



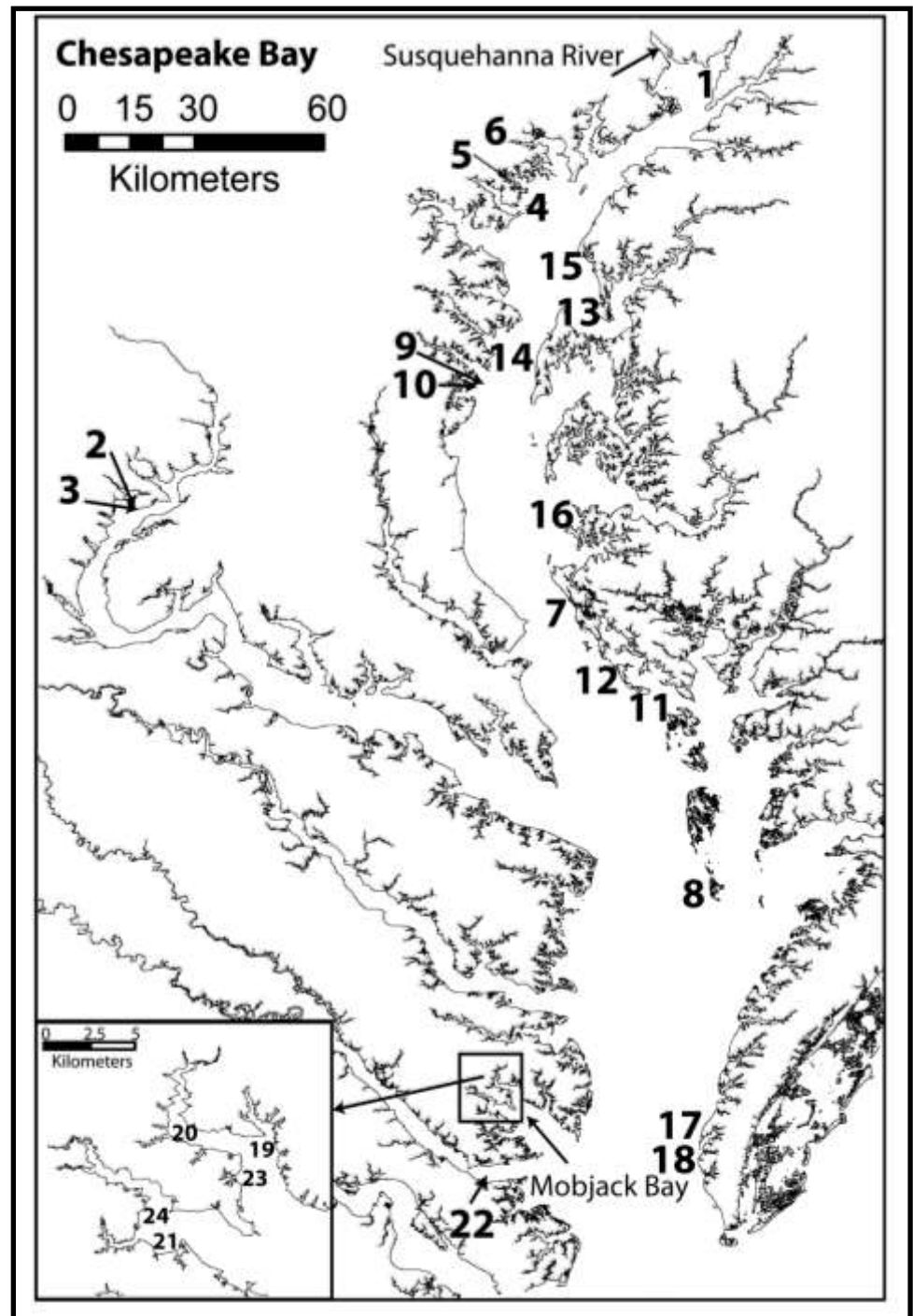
—●— Observed data
— Predicted
 $R^2 = 0.98855545$
Equation %Total Area = $96.31(1 - e^{-0.07526(\% \text{Silt} + \text{Clay})})$



Sand is of the
essence
in the creation of
viable SAV habitat!

Can breakwaters
create suitable
SAV habitat?

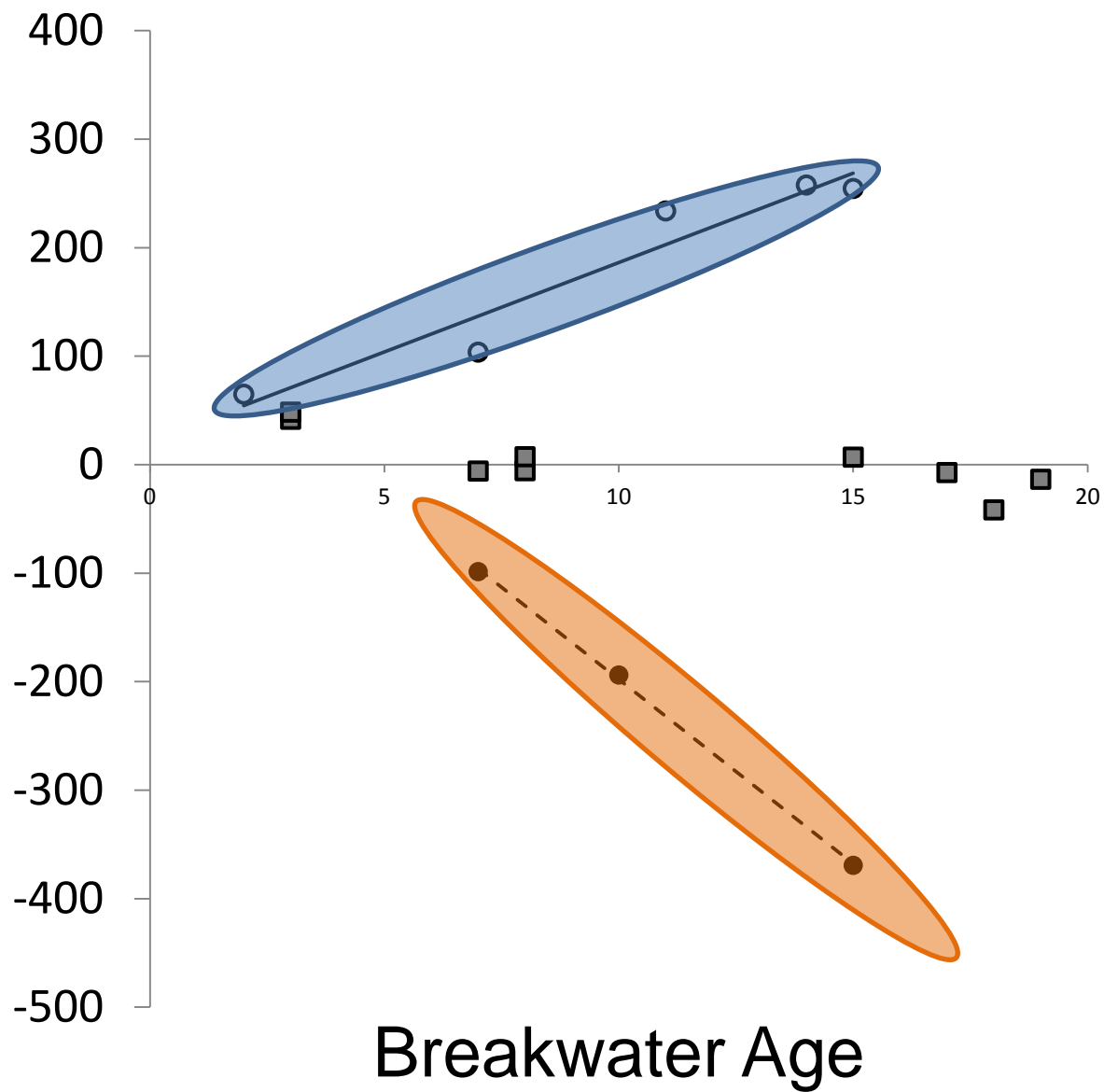
- ages from 0 to 20 yrs old

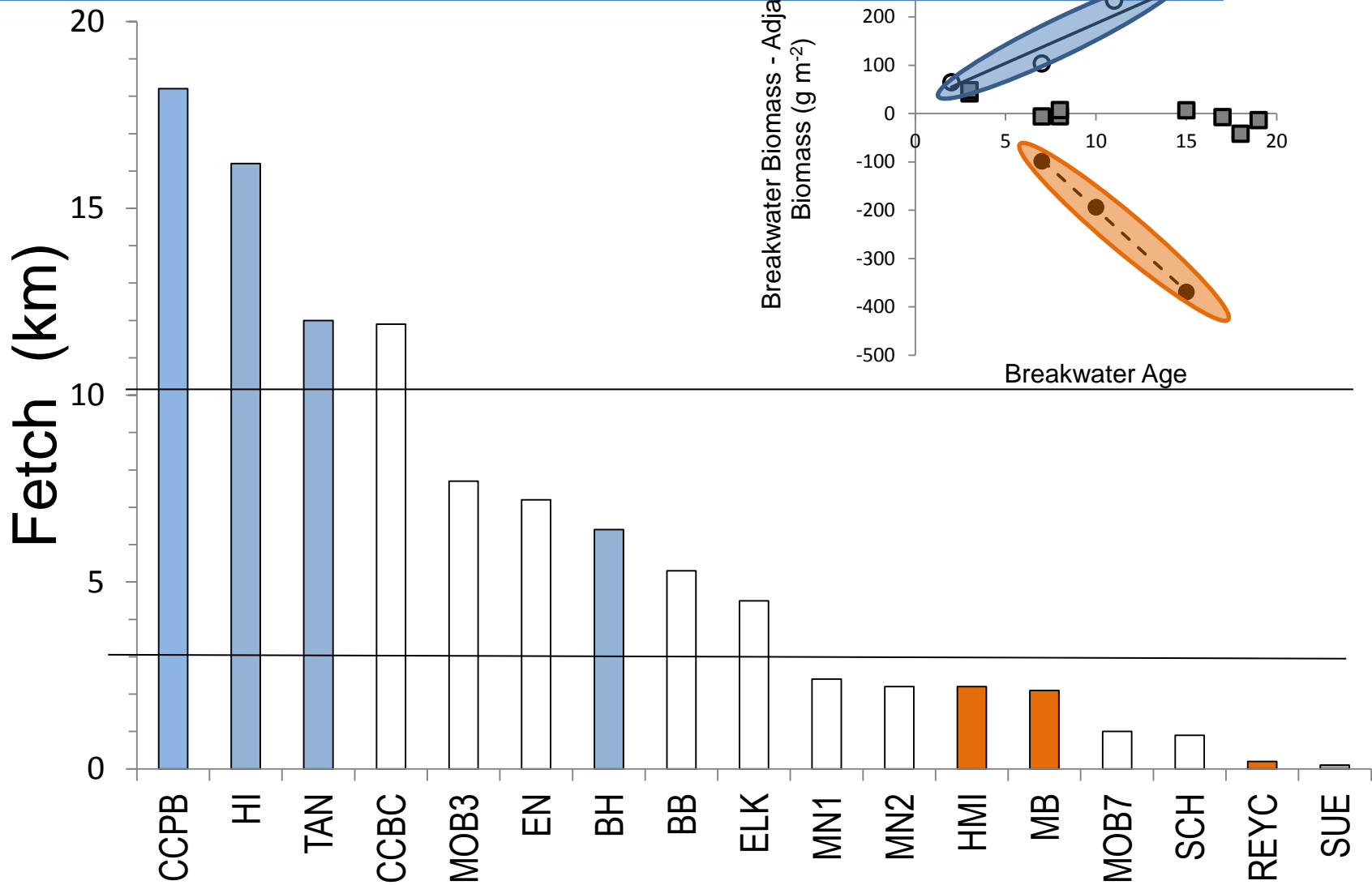


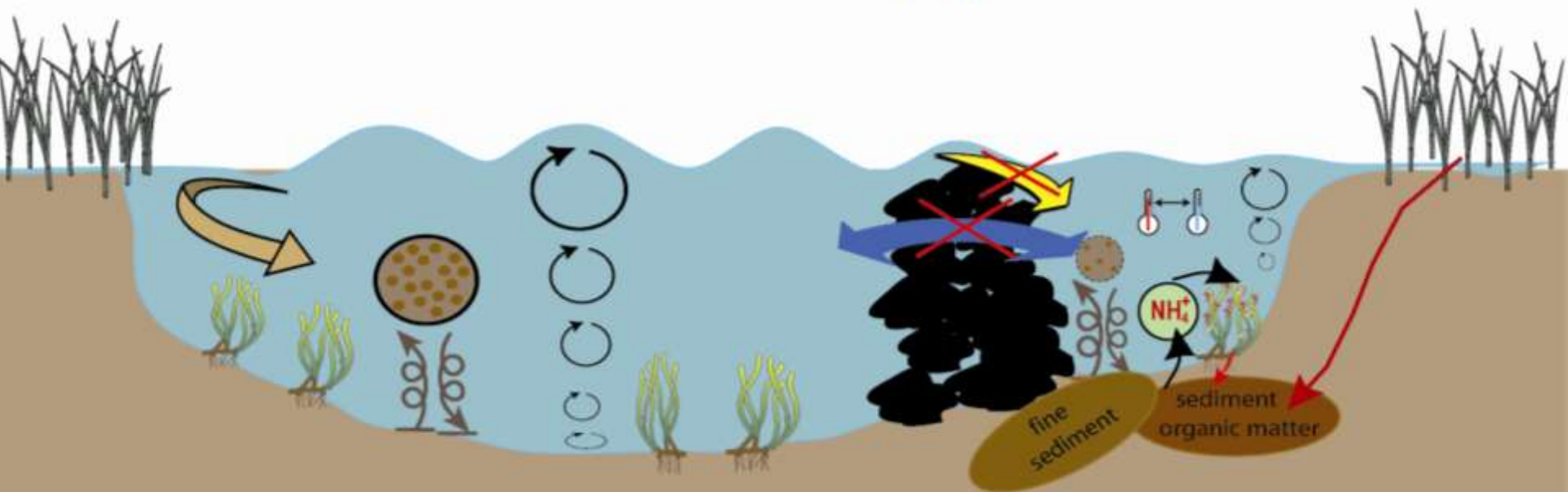
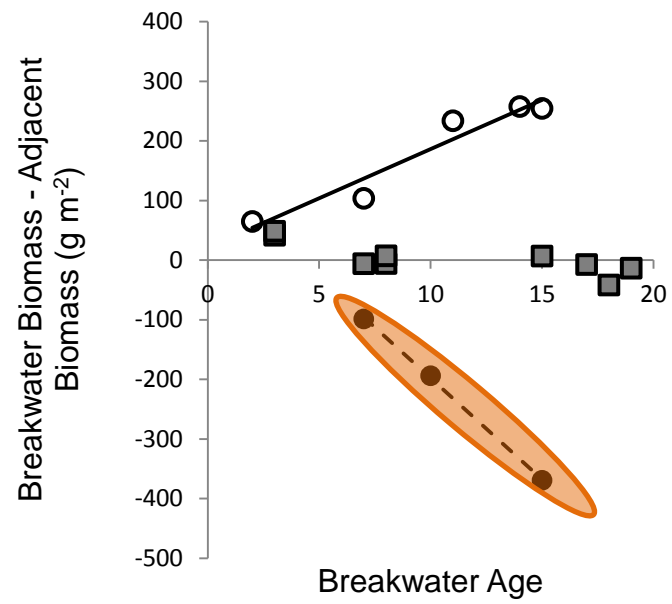


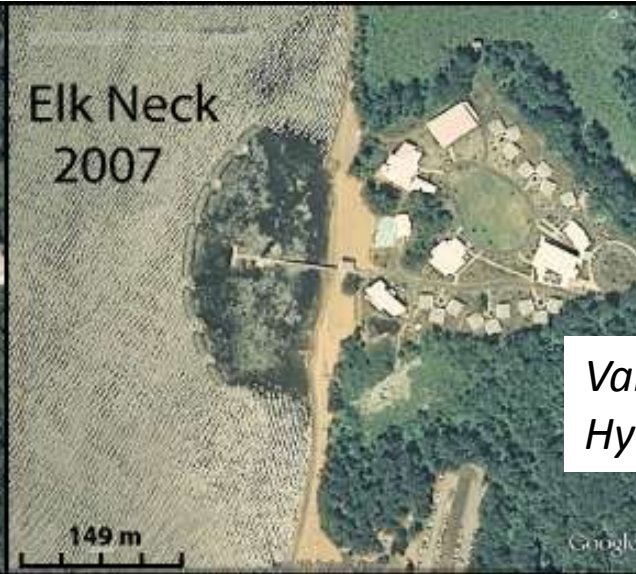
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Breakwater Biomass -
Adjacent Biomass (g m^{-2})

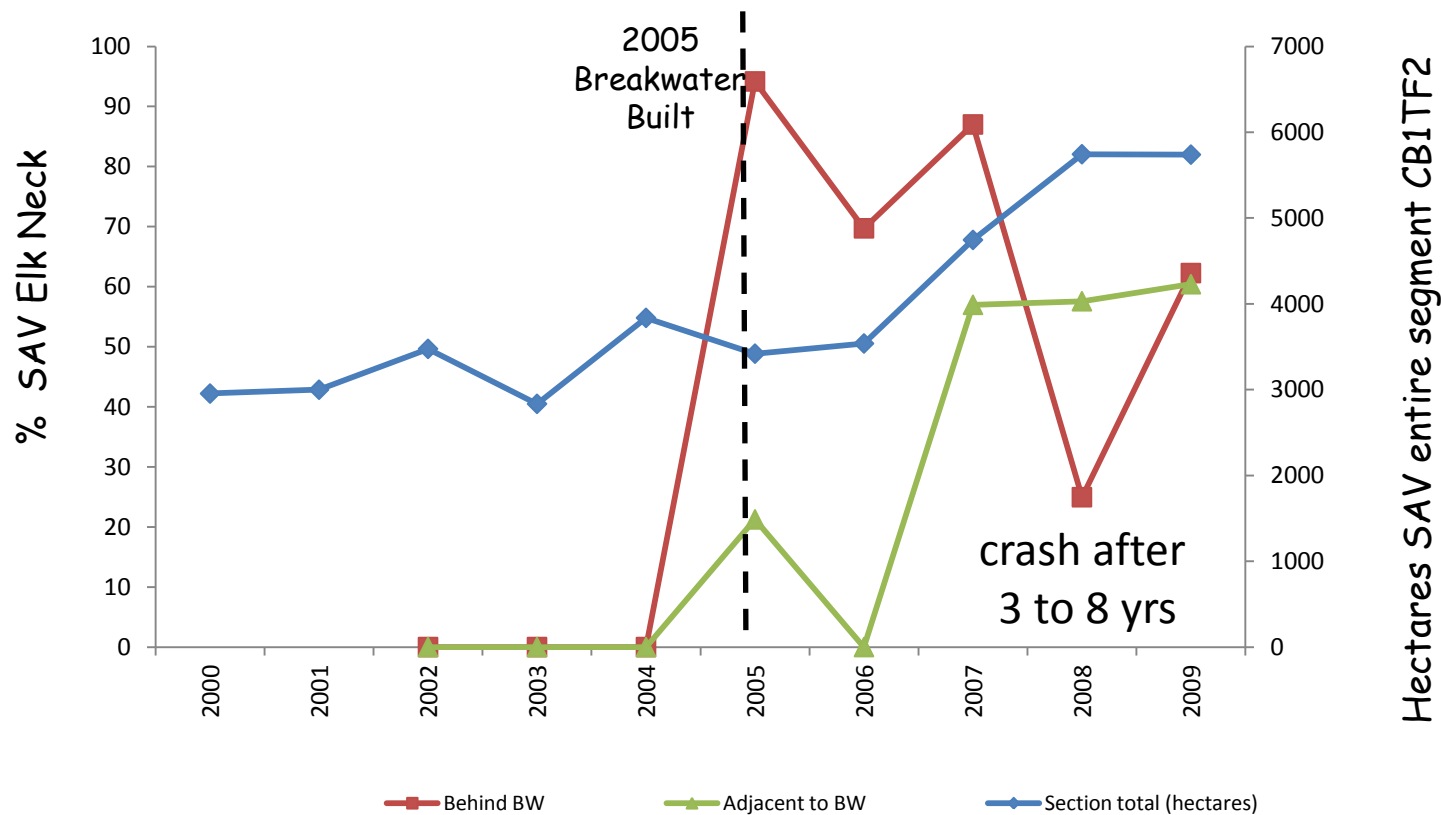






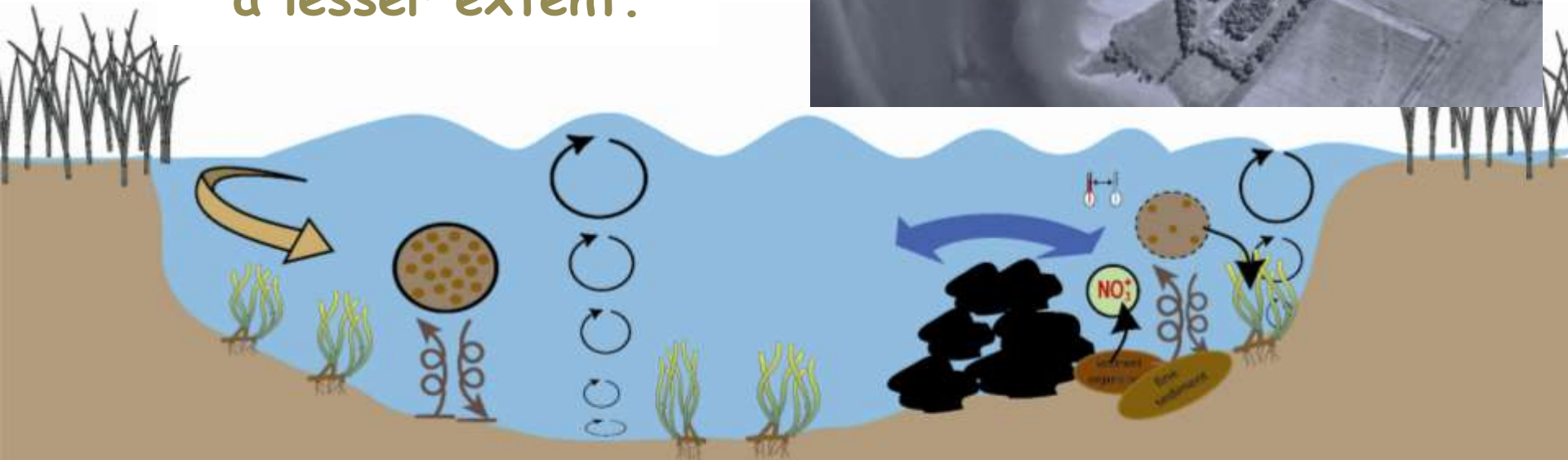
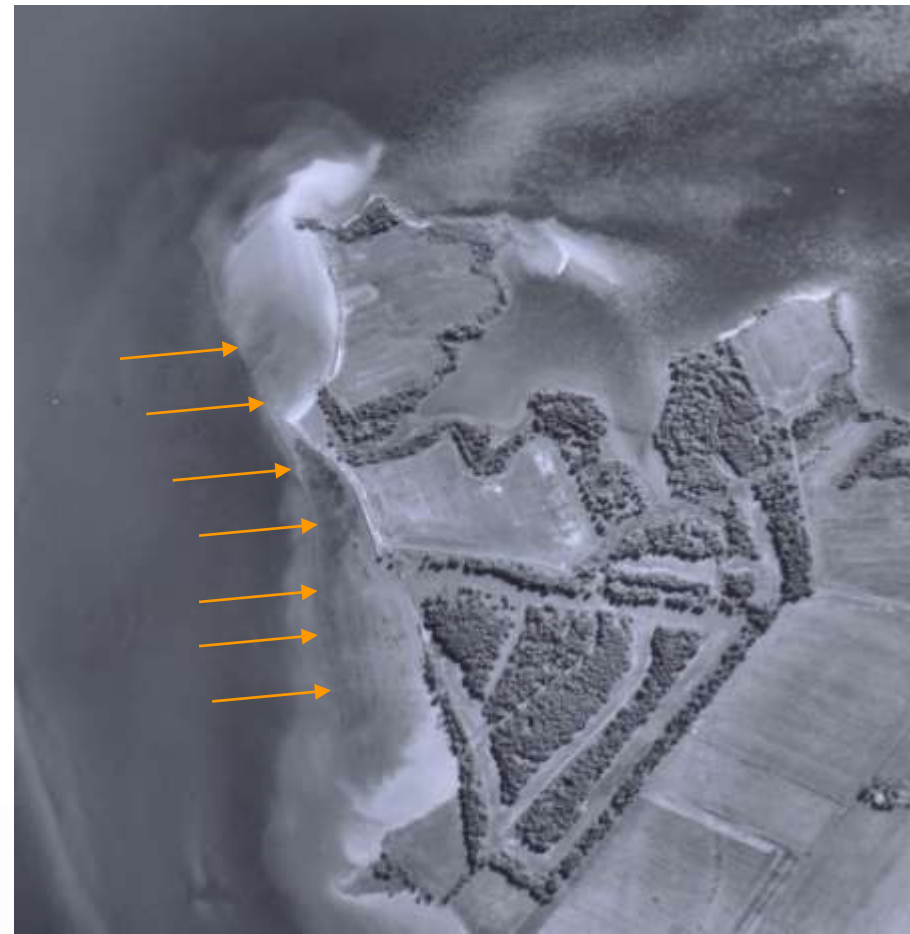


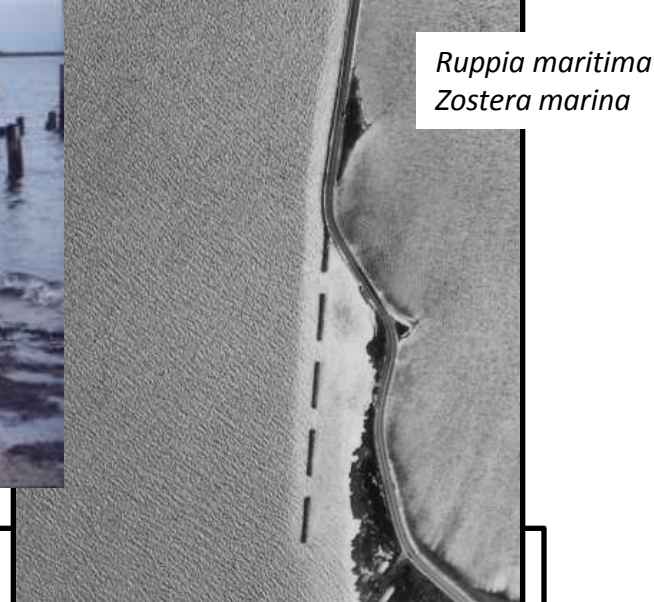
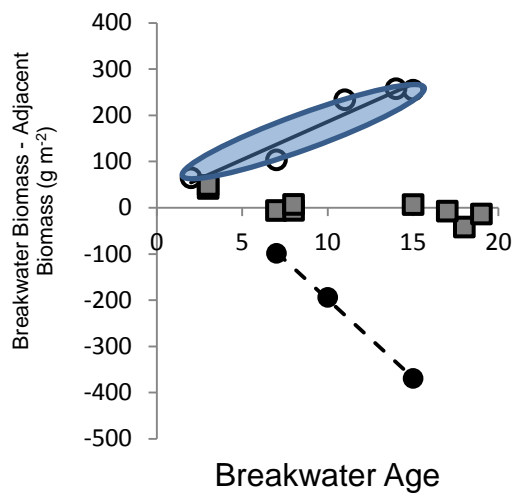
Vallisneria americana
Hydrilla verticillata



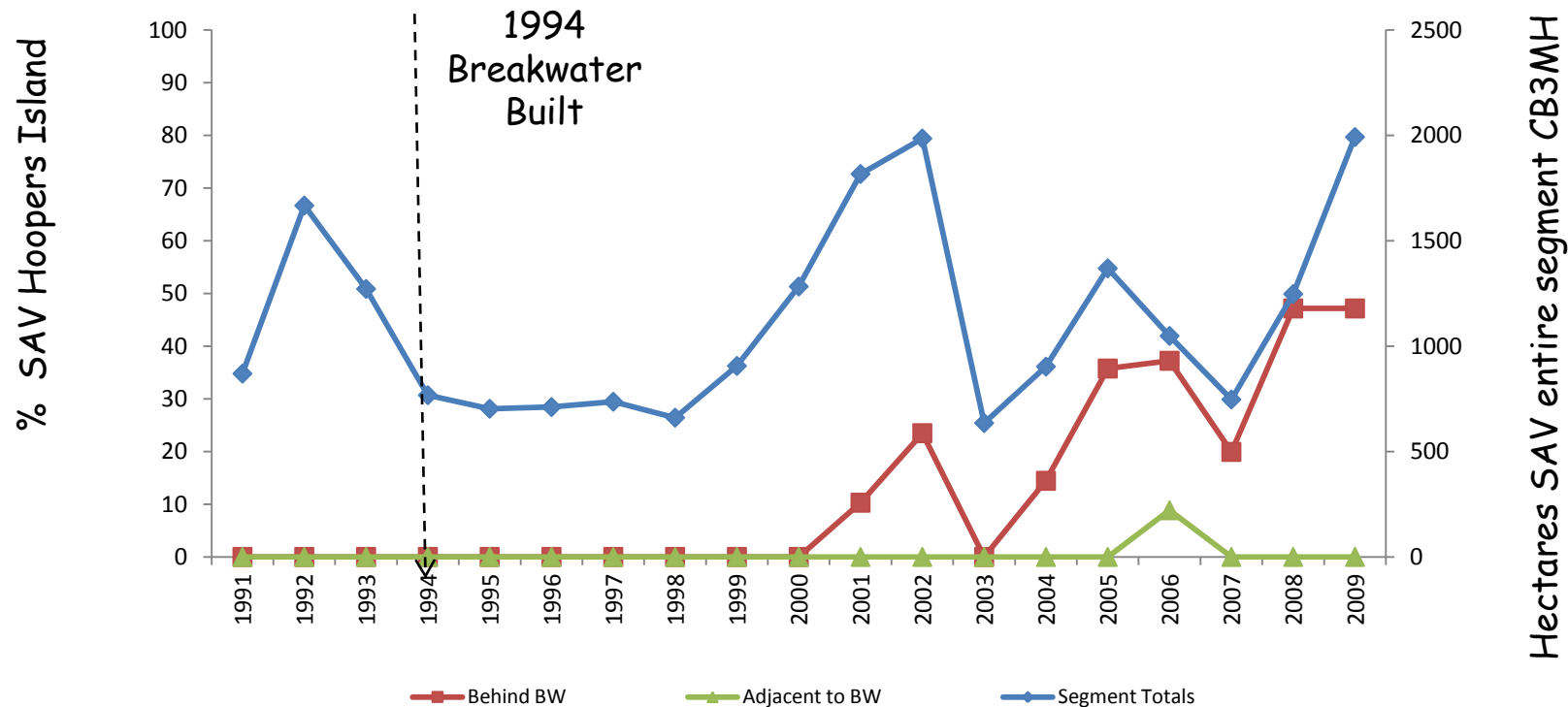


SILLS still have the same detrimental effects as some breakwaters, just to a lesser extent.





Segment SAV coverage vs. Hoopers Island



Learning from nature:
what is the right sediment accumulation rate to create
SAV habitat?

Estuaries and Coasts

DOI 10.1007/s12237-012-9542-7

**Sediment Accumulation Rates and Submersed
Aquatic Vegetation (SAV) Distributions in the Mesohaline
Chesapeake Bay, USA**

Cindy M. Palinkas • Evamaria W. Koch

Depositional rates > 9 mm/yr are beneficial for SAV

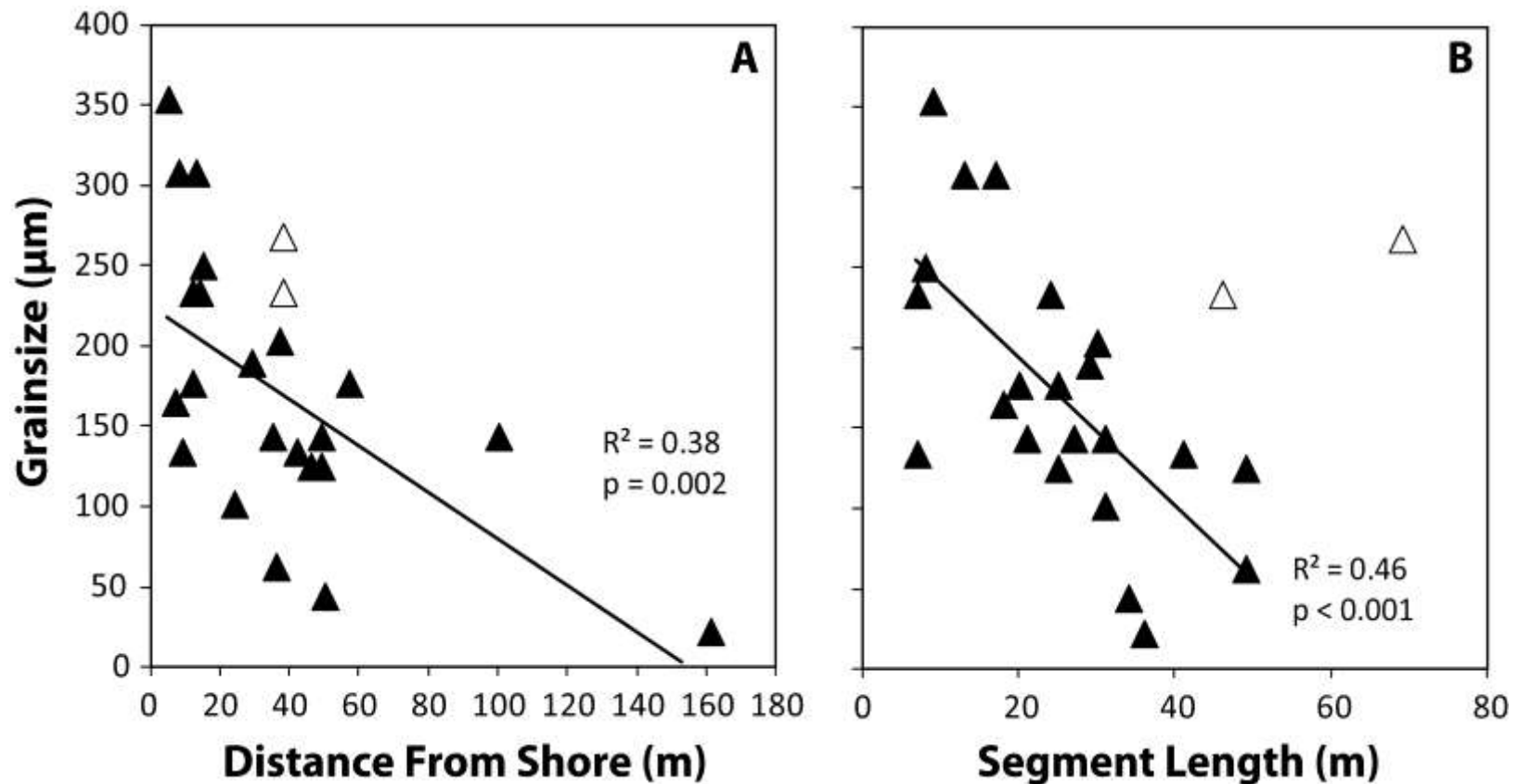
Conclusions

Breakwaters can sustain SAV populations as long as some habitat requirements are met:



- **Water quality** - regional water quality needs to be good enough to support SAV growth
- **Water depth** - deep enough so SAV can remain submersed at low tide
- **Sediment** - needs to remain sandy (<35% silt+clay) with low organic matter (<5 to 8% organic matter) over time. Sedimentation rates >9mm/yr are also beneficial but no infilling (habitat becomes intertidal)
- **Fetch** - breakwaters are most beneficial to SAV in long fetch areas (> 10 km)

Management Recommendations breakwater construction for SAV conservation and/or restoration





Management Recommendations breakwater construction for SAV conservation and/or restoration

Shoreline characteristics also need to be considered:



- **Eroding Marshes** - a layer of sand* needs to be added to cover the marsh peat in the sub-tidal (*>2cm, Wicks et al. 2009)



- **Sandy Beach** - breakwater beneficial to SAV especially when fetch > 10 km



- **Cliffs** - base of cliff needs to be stabilized to reduce sediment input and shoaling breakwater-protected area



Questions for Evamaria Koch?

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Learning from nature:
what is the right sediment accumulation rate to create
SAV habitat?

